

CLAIMS

[0050] What is claimed as new and desired to be protected by Letters

Patent of the United States is:

1. A pixel comprising:

a substrate;

a photoconversion device fabricated in said substrate, said device having a charge collection region;
a reset region of said first conductivity type fabricated in said substrate and coupled to said charge collection region for resetting said charge collection region in response to a signal applied to said reset region.

2. A pixel as in claim 1 wherein said reset region functions with said charge collection region as an extended charge collection region, said extended charge collection region being reset by said applied signal.

3. The pixel of claim 2 further comprising:

a source follower transistor for outputting a signal representing charge collected in said extended charge collection region; and

a capacitor in electrical communication with said reset channel region and said extended source follower transistor for storing charge collected in said charge collection region.

4. The pixel of claim 3 further comprising a row select transistor for selectively outputting a signal from said source follower transistor.
5. The pixel of claim 2 further comprising a pulsed voltage source for causing said reset region to periodically reset said reset region and extended charge collection region.
6. The pixel of claim 5 wherein said pulsed voltage source is coupled to one terminal of a capacitor, the other terminal of which is coupled to said extended charge collection region.
7. The pixel of claim 2 wherein said photoconversion device is a photodiode formed in a well of a second conductivity type, and wherein said charge collection region is part of said photodiode.
8. The pixel of claim 5 wherein said first conductivity type is n-type and said second conductivity type is p-type.
9. The pixel of claim 3 wherein said charge capacitor has a charge-per-unit area capacitance value of about $5 \text{ fF}/\mu\text{m}^2$ to about $10 \text{ fF}/\mu\text{m}^2$.

10. The pixel of claim 2 wherein said reset region is doped with an n-type dopant at a first dopant concentration.
11. The pixel of claim 2 wherein said capacitor is connected to said reset region through a contact region.
12. The pixel of claim 11 wherein said contact region is doped with an n-type dopant at a second dopant concentration.
13. The pixel of claim 12 wherein said second dopant concentration is higher than said first dopant concentration.
14. A pixel for use in an imaging device, said pixel comprising:
 - a charge collection region;
 - a reset region formed within said substrate adjacent said charge collection region for periodically resetting a charge level of said charge collection region in response to an applied reset signal;
 - a capacitor having one terminal in electrical communication with said reset region for storing charge collected in said charge collection region; and
 - a pulsable voltage source coupled to another terminal of said capacitor for causing said reset region to reset said charge collection region.
15. A pixel as in claim 14 wherein said reset region functions with said charge collection region as an extended charge

collection region, said voltage source resets said extended charge collection region.

16. The pixel of claim 15 further comprising:
a source follower transistor in electrical communication with said reset channel region and said capacitor for receiving a voltage stored on said capacitor and outputting a signal representing charge accumulated in said extended charge collection region.
17. The pixel of claim 16 further comprising a row select transistor for selectively outputting a signal from said source follower transistor.
18. The pixel of claim 16 wherein said capacitor has a charge-per-unit area capacitance value of about 5 to about 10 fF/ μm^2 .
19. The pixel of claim 16 wherein said reset region is doped with an n-type dopant at a first dopant concentration.
20. The pixel of claim 16 wherein said capacitor is connected to said reset region through a contact region.
21. The pixel of claim 20 wherein said contact region is doped with an n-type dopant at a second dopant concentration.
22. The pixel of claim 21 wherein said second dopant concentration is higher than said first dopant concentration.

23. A method of forming pixel, said method comprising:
 - forming a layer of a first conductivity type over a substrate;
 - forming a charge collection region of a second conductivity type in said layer; and
 - forming a reset region of said second conductivity type in said layer in contact with said charge collection region, said reset region forming with said charge collection region an extended charge collection region, said reset region being operable to apply a reset signal to said extended charge collection region.
24. The method of claim 23 further comprising:
 - forming a capacitor for storing charge collected in said extended charge collection region, said capacitor having one terminal in electrical communication with said reset region and said source follower transistor.
25. The method of claim 24 wherein said reset region is formed by implanting a dopant of said second conductivity type within said layer and adjacent said charge collection region.
26. The method of claim 25 wherein said reset region is doped with an n-type dopant at a first dopant concentration.

27. The method of claim 24 wherein said capacitor is in electrical communication with said reset region through a contact region.
28. The method of claim 27 wherein said contact region is doped with an n-type dopant at a second dopant concentration which is higher than said first dopant concentration.
29. The method of claim 23 wherein said first conductivity type is p-type and said second conductivity type is n-type.
30. The method of claim 23 wherein said charge capacitor has a charge-per-unit area capacitance of about 5 to about 10 fF/ μ m².
31. A method of resetting an imager pixel, said pixel comprising:
 - a charge collection region; and
 - a reset region in contact with said charge collection region,\said method comprising:
 - pulsing a voltage to said reset region through a capacitor.
32. The method of claim 31 further comprising providing a first voltage level to one side of said capacitor during a charge integration period, the other side of said capacitor being coupled to said reset region, and pulsing said voltage to said

one side of said capacitor to a second voltage level lower than the first during a reset period.

33. An imager pixel comprising:
 - photodiode;
 - a capacitor having one terminal coupled to a charge collection of said photodiode;
 - a first transistor having a gate coupled to said charge collection region for providing a pixel output signal;
 - a second transistor for selectively coupling a pixel output signal from said first transistor to an output conductor; and
 - a voltage source for providing a first voltage signal to another terminal of said capacitor during a period when said photodiode photo converts an incident light signal and a second lower voltage level to said another terminal during a period when said photodiode is reset.
34. The pixel of claim 33 wherein said second voltage level is substantially zero volts.